OSU

The Ohio State University

(10)

AD-A134 300

ADVANCED ADAPTIVE ANTENNA TECHNIQUES

R. T. Compton, Jr.

The Ohio State University

ElectroScience Laboratory

Department of Electrical Engineering
Columbus, Ohio 43212

Quarterly Report 714505-6

Contract N00019-82-C-0190

July 1983

Naval Air Systems Command
Washington, D.C. 20361

NOT :S

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

50272-101

REPORT DOCUMENTATION PAGE

1. REPORT NO.	**2.** AD-A134 500	**3. Recipient's Accession No.**
4. Title and Subtitle ADVANCED ADAPTIVE ANTENNA TECHNIQUES		**5. Report Date** July 1983
		6.
7. Author(s) R.T. Compton, Jr.		**8. Performing Organization Rept. No.** ESL 714505-6
9. Performing Organization Name and Address The Ohio State University ElectroScience Laboratory Department of Electrical Engineering Columbus, Ohio 43212		**10. Project/Task/Work Unit No.**
		11. Contract(C) or Grant(G) No. (C) (G) N00019-82-C-0190
12. Sponsoring Organization Name and Address Naval Air Systems Command Washington, D.C. 20361		**13. Type of Report & Period Covered** Quarterly Report
		14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This report describes progress under Naval Air Systems Command Contract N00019-82-C-0190 for the third quarterly period. Research progress in two areas is summarized: the performance of adaptive arrays with frequency hopped signals, and the performance of the Frost algorithm.

A-1

17. Document Analysis a. Descriptors

antennas, adaptive antennas, interference rejection

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED	**19. Security Class (This Report)** Unclassified	**21. No. of Pages** 3
	20. Security Class (This Page) Unclassified	**22. Price**

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

I. INTRODUCTION

This report describes progress under Naval Air Systems Command Contract N00019-82-C-0190 for the third quarterly period. This contract involves research in two areas: (1) the effectiveness of adaptive arrays with frequency hopped signals, and (2) the performance of adaptive arrays based on the Frost algorithm[1].

During the third quarter, we have completed our studies on adaptive arrays with frequency hopped signals and have begun studies on the Frost algorithm. Our progress is described below.

II. PROGRESS

A. Adaptive Arrays with Frequency Hopped Studies

During the third quarter we have completed our investigation of adaptive array performance with frequency hopped signals. We have calculated a large number of curves of output desired signal envelope variation, phase variation, output SINR (signal-to-interference-plus-noise ratio) and bit error probability as functions of hopping frequency, frequency jump size, bandwidth, interference frequency, desired and interference signal arrival angles and powers. We have also computed numerous array patterns needed to check and understand the other results obtained. These curves have been used to explore the array behavior and to determine how it varies with the signal parameters.

A technical report has been published summarizing these results and describing how the adaptive array is affected by frequency hopping[2].

B. The Frost Beamformer

During this quarter we have also begun studies on the performance of

The Frost Beamformer[1]. As a first step, we have generalized Frost's algorithm by making two changes. First, we have derived a more general form of the algorithm that allows complex weights to be used at each delay line tap. (Frost assumed a tapped delay line processor with real weights.) This change is important because it allows us to use the algorithm to impose pattern constraints on an array that has a single complex weight behind each element. For applications in narrowband radio communications, the Frost beamformer will most likely take this form. Second, we have also generalized Frost's constraint equations to allow the array to be steered to angles other than broadside.

III. PLANS FOR NEXT QUARTER

Next quarter we plan to continue on the Frost beamformer. Computer programs will be developed to evaluate the output SINR from a Frost array as a function of the signal scenario and for different types of constraints.

IV. FINANCIAL

As of March 31, 1983, a total of $63,616.39 has been expended and an additional $1424.05 has been committed but not yet paid, leaving $14,926.56 available to be spent on this contract.

V. REFERENCES

[1] O.L. Frost, III, "An Algorithm for Linearly Constrained Adaptive Array Processing," Proceedings of the IEEE, Vol. 60, No. 8, (August 1972), p. 926.

[2] L. Acar and R.T. Compton, Jr., "The Performance of an LMS Adaptive Array with Frequency Hopped Signals," Report 714505-5, June 1983, The Ohio State University ElectroScience Laboratory, Department of Electrical Engineering, Columbus, Ohio 43212; prepared under Contract N00019-82-C-0190 for Naval Air Systems Command.